NEWSLETTER

DIGNAN PHOTOGRAPHIC INC., 12304 ERWIN ST., NO. HOLLYWOOD, CALIF. 91606

Vol. 0 - 0-294/0-312

NOVEMBER 1969

MAKE YOUR OWN MONOBATH
by Grant Haist
page 0-294

A REVIEW OF H & W CONTROL
page 0-299

SUPERULTRAMICROFINEGRAINOL X 1:3?
by Adrian Vance
page 0-301

UNIVERSAL REVERSAL FORMULAS FOR B & W FILMS
by Reichner & Figoten
page 0-303

KODAK'S OFFICIAL ECO-1 & ECO-2
page 0-308

EDITORIAL

Well, we are back to basic black again. Hopefully, we have made our point.

The photographers of the world learned a number of expensive lessons from our astronauts during their recent rock-collection expedition on the moon. We hope you are all paying attention. For instance, to fix one camera, always use another camera as a hammer. After shooting your films, always save the film, but throw the camera away. Never use a light meter - always guess at exposure. We were also surprised to learn that you cannot tell when you are pointing a camera at the sun without a view finder.

Although we feel we did receive an education, we are a little perplexed. We would like to know what button or dial on a Hasselblad is called a "ding-a-ling." We don't like to get political, but we do wonder how much each laugh cost us in taxes!

LUMINOS COLOR PAPER

It is the consensus of the people who are using Luminos Color Paper, that it is great for portraits. We still have a large stock available. 25 sheets of 8" X 10" are $7.50 per package and 100 sheets of 8" X 10" are $27.75 per package (Postpaid, U. S. A.).

H & W CONTROL

This developer is reviewed in this issue. It is available from H & W Control, Box 332, St. Johnsbury, Vermont 05819, at a cost of $2.00 for the 4 oz. concentrate. (Postpaid, special handling charge is .25¢ extra.)

E-4 FORMULA

Until Dave Murray can devote more time to simplifying and improving his E-4 formulas, we suggest substituting the ME-4 color developer, (see page G-160) without the fogging agent RA-1 resorting to re-exposure before utilizing this solution.

For some unknown reason, E-4 kits are on back order in the Los Angeles area. Perhaps we are in for a new group of changes.

MONO BATH MANUAL

This issue contains excerpts from a book called "Mono Bath Manual" by Grant Haist. We recently read it and then re-read it at least 3 more times. It is a treasure house of photographic chemistry for the experimenter. It not only gives a complete history of mono baths, but also lists formulas and pertinent information from the patent literature.

You will learn about many strange and exoctic chemicals that have been used in an attempt to produce the perfect bath. It explains that, to date, the perfect mono bath has not yet been produced. It is an easy book to read and will supply you with an abundance of little known knowledge on photographic chemistry in general plus a greater understanding of mono baths.

It was written by a scientist who has been one of the pioneers in mono bath chemistry and who has many patents on the subject. We are quoting a number of pages from the book by permission from the author. It is available from Morgan and Morgan, Inc., Hasting on Hudson, New York, NY 10706. Its selling price is $6.95.

K-12 HAS REPORTED IN!

Some times we feel that we are in competition with the CIA. Official Kodachrome K-12 has been received from one of our more reliable spys, with the following cryptic note attached.

> "Here are the latest Kodachrome formulas, up to date. No changes have been made since 1967. Poisonous as hell chemicals are involved, requiring goggles, gas masks and hoods. Borohydrides cause irreversible liver damage, and are absorbed through the skin.
>
> As always, Pat, if you or your agents are apprehended by the enemy, I will deny all knowledge. This letter will self-desctuct in 5 seconds if dipped in water (no kidding - try it - it is on soluble paper!)"

We did try it and it was soluble, however, we did manage to make some copies. These will be run in the Newsletter shortly.

MAKE YOUR OWN MONOBATH

by

Grant Haist

Certainly, you can make your own monobath! It would be an advantage if you have had any scientific training, especially chemical. But if you have not had any formal training, you can still formulate a monobath that will fit your individual needs. Amateur experimenters were responsible for the perfecting of photography at its very beginning. Many of the important early discoveries were made by amateur investigators. And certain of the major discoveries, such as the use of gelatin as a carrier for silver halide emulsions by R. L. Maddox, an English amateur, in 1871, are still a basic part of the photographic process today. Even in the complex field of color photography, two musicians, L. D. Mannes and L. Godowsky, are generally credited with a major part in the development of the Kodachrome film that was introduced in 1935.

"A fool," said Erasmus Darwin, grandfather of Charles Darwin, "is a man who never tried to experiment." And it is a foolish photographer who believes that the creative possibilities of photography are entirely independent of the processing chemistry that produces the silver image. Yet, writers of photographic books and magazine articles often discourage non-professionals from modifying the chemical composition of photographic solutions. These journalists state that if the research laboratories of the large photographic manufacturers have not introduced a better product, then there is little hope for the individual to succeed. This fallacious reasoning presupposes that human ingenuity or serendipity occur only within the confines of the research laboratory. In truth, invention is the result of individual genius and can come to those who never enter a research building. Industrial laboratories excel in perfecting ideas that often have been originated and nurtured by non-professionals.

If you were to compete with a research laboratory on the same development project, the organized research group would probably achieve success first. However, in photography, there are many fields where such direct competition does not occur because the individual needs of each consumer are too specific to be satisfied by a general product. It is unprofitable to make a product for a very limited market. This is the current situation with monobaths. With present-day film and paper materials designed for 3-bath processing, a high-quality monobath can usually be made for only one film or paper. If this bath is used with other films or papers, much poorer results are generally obtained.

Commercial monobaths are often compromise formulations that attempt to process a number of photographic products fairly well, but fail to give the best results possible with each film or paper. Practical marketing economics require the bath to

appeal to as wide a market as possible to insure commercial success, but the general-purpose monobath usually fails to please anybody but the uncritical. This situation accounts, in part, for the disappearance of commercial monobaths from the market shortly after their introduction.

A monobath formulated to process your particular film choice with your conditions of processing can provide excellent results. But if you are to achieve top-quality image formation with the simplicity of single-solution treatment, you must make the bath yourself. At present there is little other choice. Making a monobath may require you to become more knowledgeable in the science of photographic chemistry and in the evaluation of the photographic results of your tests. But scientific training is not absolutely necessary. Already, you have probably made experiments to determine the best guide number for your favorite size of flashbulbs or a new electronic flash unit. And I am certain that most of you were exposing film at higher-than-recommended ASA indexes long before the scientists decided to double the indexes to their present values.

In each of these cases, you started with some known information and adapted it to your specific needs to obtain the optimum results. The changes resulting from your scientific testing made possible photographic results that were superior to following blindly the published directions. By starting with known monobath compositions, you can make experimental variations until you arrive at a bath that will not only develop your film satisfactorily, but will save time and money.

To make a monobath it is not absolutely necessary to start with each individual ingredient in order to select one from the many available. The easiest approach is to choose a published formula (a recently published formula that was designed for use with present-day film products), then test your film in it, modifying the composition until satisfactory results are obtained. I wish I could provide you with ready-to-use monobath formulas, but results obtained under your processing conditions would not be exactly the same as those that I obtained. In the past, many monobath investigators have failed to duplicate the results of published formulas because of individual differences in film products or processing conditions.

There are a few guides that can be provided to direct your testing of monobath solutions. Generally, you must compensate for one of two possibilities: (1) Either the developing activity is too vigorous, resulting in high contrast and an emulsion speed increase for the photographic material, or (2) the fixing action is too fast, producing low contrast and an emulsion speed loss. A practical monobath requires that a competitive balance be achieved so that adequate image development occurs before the fixing action removes the developable silver salts. The amount

of fixing agent present is largely determined by the quantity of the silver halide of the photographic film or paper because a minimum concentration of the fixing agent is necessary to clear the emulsion layer in the desired time. Formulating monobaths often involves securing sufficient image development in a monobath solution containing this minimum amount of the fixing agent.

To effect changes in the rate of image formation or the rate of fixation, the following suggested guides can be used in the making of a monobath:

TO INCREASE CONTRAST AND EMULSION SPEED

(1) Make the solution more alkaline

(2) Increase the quantity or use more active developing agents or superadditive combination of agents.

(3) If more contrast is needed, increase the quantity of hydroquinone or ascorbic acid present in the solution. If more emulsion speed is required, increase the concentration of Phenidone or Metol in the monobath.

(4) Raise the processing temperature, if possible, because the gain in the rate of development is greater than the gain in the rate of fixation with higher temperatures.

(5) Reduce the amount of fixing agent present, if possible, although the minimum amount of the fixer must be sufficient to clear the film in the desired time of processing.

TO LOWER CONTRAST AND REDUCE EMULSION SPEED

(1) Increase the quantity of the fixing compound or utilize more active fixing agents.

(2) Lower the alkalinity of the solution, as the developing action will be decreased significantly, but the fixing rate of many compounds will be relatively unchanged.

(3) More vigorous agitation increases both the rates of development and fixation, but the clearing rate will be accelerated more than development.

(4) Increasing the salt content of the bath or its viscosity slows the rate of diffusion of the fixing agent, thus lowering the effective rate of fixation.

In adjusting a monobath to meet your requirements, it is necessary to maintain all testing conditions constant so that any change in image characteristics is the sole result of the intended variation of the formula. A standardized, repeatable method of ex-

posing the film should be employed rather than using valuable exposures of varied subjects. Because the intensity of daylight varies widely from day to day, some indoor set-up will probably be necessary, preferably consisting of a readily available person or some pieces of paper ranging in tone from white to black. Electronic flash (with at least double the charging time after the ready light comes on) furnishes an excellent means of securing reproducible light intensity for illumination.

One set of film exposures should be processed in your usual developer to provide a comparision for the monobath-processed film. The same solution temperature for each test should be maintained, as well as employing a repeatable form of agitation. If non-uniformity of image density is evident, increase the time of the initial period of agitation in the monobath solution. If the film emulsion should not be cleared when the film is inspected (indicating insufficient fixing agent concentration), immerse the film quickly in a fixing bath. Little damage, if any, will probably result to any valuable exposures, as the film will have lost most of its light sensitivity even though complete clearing has not occurred.

Addition of chemicals to a monobath solution may cause a change in the alkalinity of the solution. Because the solution alkalinity has a very influential effect upon the action of the developing agents, it is necessary in most cases to maintain the same alkalinity when another change in the monobath composition is being studied. Increasing the quantity of hydroquione or other developing agents may cause the alkalinity to drop if the solution buffering is inadequate, requiring the addition of alkali to restore the original condition. An indication of the alkalinity of a solution can be most inexpensively determined with test papers that change color at definite values. Such test papers are available from laboratory supply houses, for example, the Fisher Alkacid Tester with Alkacid Test Ribbon (Fisher Scientific Company, with branches in major cities) or pH Control Paper (Precision Laboratories, Rossmoyne, Ohio). Of course, if available, pH meters can be used.

Some of you may want to make your own monobath, but not wish to stock and weigh out the separate chemical ingredients. This approach would require combining an available developer with good buffering capacity with a lesser amount of a fixing bath. Generally, the hardener of the fixing bath often causes precipitation when the two solutions are added together. A fixing bath without a hardener will prevent this difficulty. E. Scully in the Camera 35 magazine (February/March 1964) proposed combining 1 part of Kodak Rapid Liquid Fixer (without the hardener, which is packed separately) with 9 parts of the stock solution of Kodak Dektol Developer. A 10-minute processing time was given for Kodak Panatomic-X Film, the only film recommended for this monobath. Image contrast was said to be high, suitable for microfilming cancelled checks or copying documents.

The Scully monobath does indeed give high contrast and increased film speed with Panatomic-X or Tri-X Pan films. The contrast increase is much less with Verichrome Pan film. Contrast can be reduced by lowering the alkalinity of a monobath, as indicated previously in the suggestions for modifying monobaths. Glacial acetic acid, a liquid used for making stop baths, is found in most darkrooms. Adding 6 milliliters of glacial acetic acid (21 milliliters of the 28% acetic acid) will reduce the alkalinity of the Scully monobath so that the contrast is only slightly higher than that given by D-76 development of the Panatomic-X film. Unfortunately, there is a considerable loss in emulsion speed. Because of the low concentration of the fixing agent, most films other than the Panatomic-X will not clear in 15 minutes in the acidified monobath. The addition of a more active developer to a greater quantity of fixing bath provides a field of experimentation for further study.

Attempting to mix a monobath from commercially available photographic solutions places severe limitations upon the versatility of the monobath, although this technique is very attractive for simplicity and ease of making. Generally, it is desirable to mix the ingredients of a monobath from a formula, because the chemicals cost less than the prepared products and greater variation in the chemical composition of the bath is possible.

If you use Panatomic-X film, you might be interested in preparing Monobath 438, introduced in 1957 by H. S. Keelan, then of the Boston University Research Laboratories, and later associated with the Cormac Chemical Corporation, makers of the Unibath combined developers and fixers. The formula for this bath is as follows:

MONOBATH 438

Purpose	Ingredient	Quantity
Solvent	Distilled water at 120°F	700 ml
Developing Agent	Hydroquinone	15 grams
Preservative	Sodium Sulfite	50 grams
Developing Agent	Phenidone	10 grams
Buffer	Potassium Alum	18 grams
Alkali	Sodium Hydroxide	18 grams
Fixing Agent	Sodium Thiosulfate	60 grams
Solvent	Water to make	1000 ml

Keelan reported that a 4-minute, 68°F, processing of Panatomic-X roll film maintained the normal emulsion speed. The image contrast was somewhate higher than that given by D-76 developer, but was said to be satisfactory for ordinary photographic applications. Keelan also reported that the "best prints are obtained when this film is exposed at ASA 200." This formulation provides a starting point for modification to suit your individual processing requirements for Panatomic-X film.

The Scully monobath does indeed give high contrast and increased film speed with Panatomic-X or Tri-X Pan films. The contrast increase is much less with Verichrome Pan film. Contrast can be reduced by lowering the alkalinity of a monobath, as indicated previously in the suggestions for modifying monobaths. Glacial acetic acid, a liquid used for making stop baths, is found in most darkrooms. Adding 6 milliliters of glacial acetic acid (21 milliliters of the 28% acetic acid) will reduce the alkalinity of the Scully monobath so that the contrast is only slightly higher than that given by D-76 development of the Panatomic-X film. Unfortunately, there is a considerable loss in emulsion speed. Because of the low concentration of the fixing agent, most films other than the Panatomic-X will not clear in 15 minutes in the acidified monobath. The addition of a more active developer to a greater quantity of fixing bath provides a field of experimentation for further study.

Attempting to mix a monobath from commercially available photographic solutions places severe limitations upon the versatility of the monobath, although this technique is very attractive for simplicity and ease of making. Generally, it is desirable to mix the ingredients of a monobath from a formula, because the chemicals cost less than the prepared products and greater variation in the chemical composition of the bath is possible.

If you use Panatomic-X film, you might be interested in preparing Monobath 438, introduced in 1957 by H. S. Keelan, then of the Boston University Research Laboratories, and later associated with the Cormac Chemical Corporation, makers of the Unibath combined developers and fixers. The formula for this bath is as follows:

MONOBATH 438

Purpose	Ingredient	Quantity
Solvent	Distilled water at 120°F	700 ml
Developing Agent	Hydroquinone	15 grams
Preservative	Sodium Sulfite	50 grams
Developing Agent	Phenidone	10 grams
Buffer	Potassium Alum	18 grams
Alkali	Sodium Hydroxide	18 grams
Fixing Agent	Sodium Thiosulfate	60 grams
Solvent	Water to make	1000 ml

Keelan reported that a 4-minute, 68°F, processing of Panatomic-X roll film maintained the normal emulsion speed. The image contrast was somewhate higher than that given by D-76 developer, but was said to be satisfactory for ordinary photographic applications. Keelan also reported that the "best prints are obtained when this film is exposed at ASA 200." This formulation provides a starting point for modification to suit your individual processing requirements for Panatomic-X film.

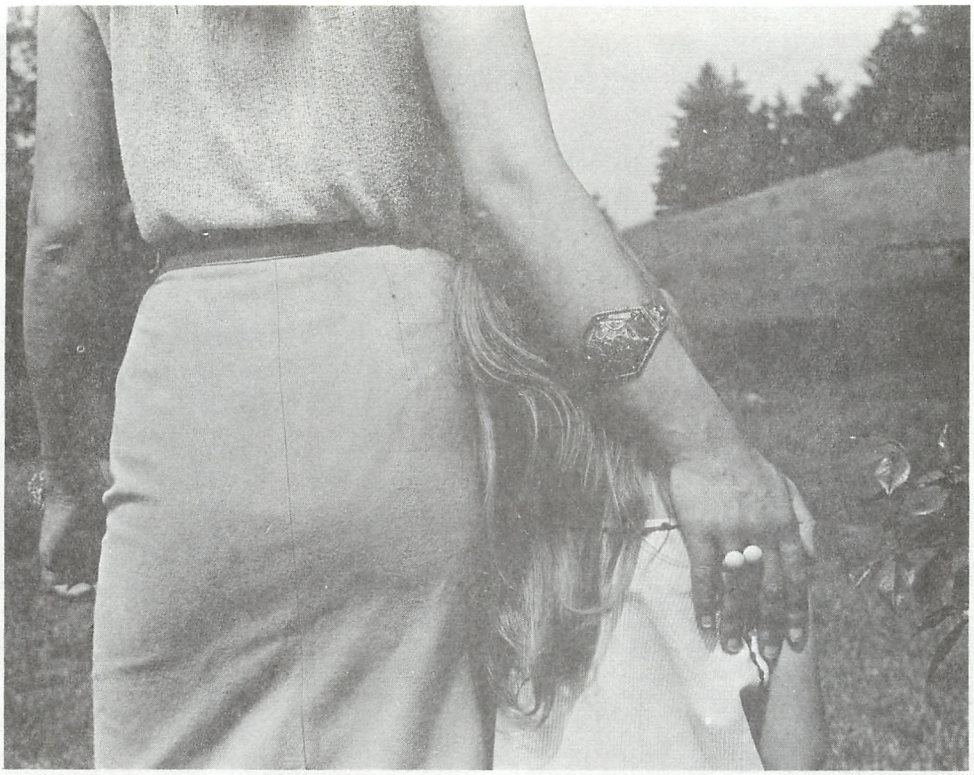

Figure #1

Part of the following information is from H & W Control literature and has been edited by us.

H & W CONTROL

The effectiveness of any developer is limited by the structure and size of the grain in the emulsion. Since Kodak High Contrast Copy Film has a very fine-grain panchromatic emulsion, it is a film most eminently suited for the achievement of exceptional standards of quality.

Heretofore, the application of High Contrast Copy Film has been specialized because of the unavailability of a developer to produce negatives with continuous printing tones at a practical E.I. H & W Control is especially designed to realize the potential of this emulsion. Using this combination, the 35mm photographer can produce photographs of a level of quality up till now associated only with larger negatives.

Some unsharpness has been an expected and unavoidable defect of 35 diameter enlargements. As Figure #2 indicates, (next page), 35X enlargements from high contrast copy film and H & W Control need not show any unsharpness at any viewing distance.

(If unsharpness is evident, the cause will be found in the equipment and/or procedures used. The same superior characteristics which allow photographers to achieve the highest standards of excellence will also permit the effects of inadequate equipment and/or procedures to show with greater clarity.

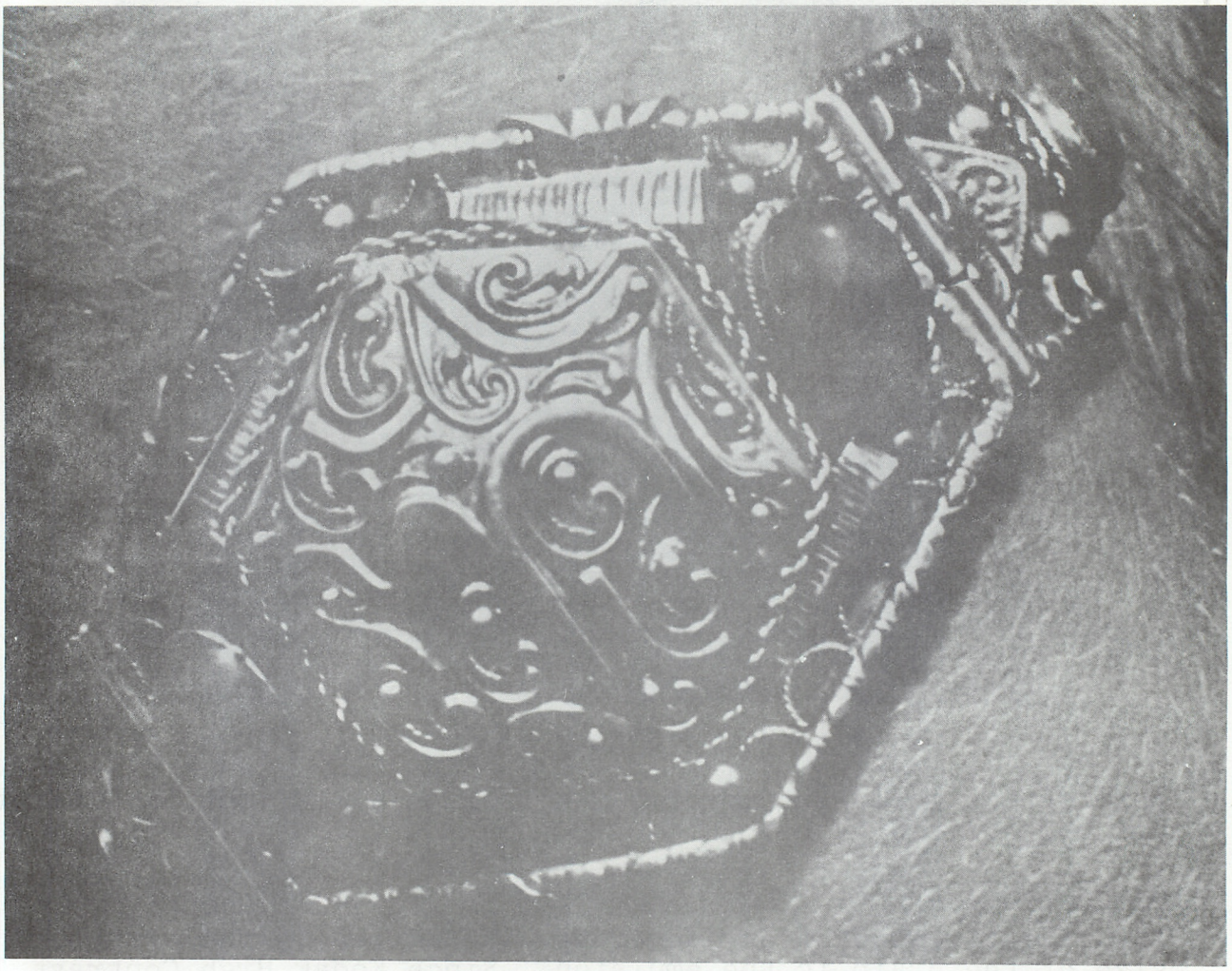

Figure #2

H & W Control is a concentrated developer which can be either made to a stock solution, which is then further diluted just before use, or it can be used in small quantities directly from the bottle to make a developing solution. Each bottle will develop 22 rolls of High Contrast Copy Film. NOTE: 6cc of H & W Control will make 8 oz. of developer. The manufacturer claims an ASA of 25 when developed for 16 minutes at 68°f.

Kodak High Contrast Copy Film is available in 36-exposure 135 magazines as well as 100 ft. bulk rolls. Another of the very thin emulsion panchromatic films satisfactory for use is Fuji Microfilm Negative HR, also at an EI of 25.

EDITORS NOTES:

Figure #1 is a cropped 35mm frame. In our correspondence with the manufacturers, they mentioned that in Vance's article "Extended Range Developing", (May 1969 Newsletter, page I-182) they felt that we were wrong in listing Pan X at ASA 4. and High Contrast Copy Film at ASA 10. As far as we are concerned, the information in Vance's article is correct and our tests indicate that when using H & W Control for from 16 to 20 minutes at 68°f using High Contrast Copy Film, it will produce an E.I. of 10.

SUPERULTRAMICROFINEGRAINOL X 1:3?

by

Adrian Vance

Some friends of mine and I were sitting around the other day and we were looking at some photographic negatives with a microscope. "You see one, you've seen them all," said Fred. The negatives had been processed in a variety of developers, but the film had come from the same 100 foot roll of Panatomic X. Fred was right, all of them did look the same. How could this be? Don't you have to use D 76 for full speed and Microdol X 1:3 for fine grain and D 19 for maximum sharpness? And, what about some of the new high speed formulas like PQD? And, what about divided developers like Farbers Divided Developer?

I chucked what remained of the 100 foot lump of Panatomic X in the loader and began winding four fifteen shot rolls. In the studio, I exposed each roll in exactly the same manner, which included a gray scale and resolution test charts.

Individual rolls were processed as follows:

Microdol X 1:3 for 15 minutes at 25°C

D 76 for 7 minutes at 20°C

PQD "two minute cycle"

D 19 for 6 minutes at 20°C

PQD is a new product that comes in a kit with four bottles. The first two appear to be developers, not a divided developer system, but two different developers. The third and fourth solutions stop, fix harden, and clear the film of residues. The maker claims a doubling of speed indices for Tri-X and Panatomic X. As soon as the films were dry, I made the instrument readouts on the microscope and densitometer.

DEVELOPER	RESOLUTION	GAMMA	GRAY CARD	E.I. (50)
FDD & P	61 lines/mm	0.85	1.51	2N
MICRODOL X	61 lines/mm	0.70	1.35	N
D 76	61 lines/mm	0.80	1.24	N
PQD	48 lines/mm	0.60	1.27	N
D 19	61 lines/mm	1.3	2.00	3N

The low resolution of PQD apparently comes from some undetermined effect on the emulsion. This system did produce the lowest gamma, but this in itself would not account for the low figure. I have seen 80 line/mm negatives from gamma 0.5 systems.

The high gamma of D 19 did nothing to improve the acutance of the film and this particular lens is only capable of 61 lines per millimeter. We'll have to screw it back on the bottom of the beer bottle.

The 3N, E.I. 150 rating for D 19 assumes that you might want to make continuous tone negatives from this combination. This would require the exposure to be pushed down into the toe of the H & D curve for this system. All films were rated at E.I. 50 for this test as I wanted some additional information from the gray card and gamma test.

In the past, I have elected to use certain developers because "this one is recommended for fine grain," "that one is for speed," and so on through the parade of yellow cans. A little investigation into the formulas will show you that about all the difference in these powders is the ratio of Hydroquinone/Metol (Elon). Fine grain developers have ratios on the order of 2 to 1 and high contrast formulas have ratios of 9 to 1.

From my examination of the negatives under 100X and 440X magnification, and the photomicrographs at 100X, it seems safe to conclude that "grain" is determined by the emulsion itself and you can soak it in any kind of reducing system you like, but the particles will be the same.

If I can detect no difference at 440X, what difference will anyone hope to see at 8X, and 8 X 10 enlargement, or at 30 to 40X projection? The acutance is built into the film. About all a developing system can do is get it out as is or muck it up. SUPERULTRAMICROFINEGRAINOL X 1:3? Come on...

* * *

UNIVERSAL REVERSAL FORMULAS FOR B & W FILMS

by

D. William Reichner
and
Martin Figoten

We would like to recommend to those readers who have never made Black and White slides, to try this procedure. We do not mean to imply in any way that color slides are undesirable - on the contrary - about 95% of all slides that we have made have been in color, with different color films serving different purposes for us.

In our opinion, Agfachrome films produce a more pastel, natural color rendition (as do most European color films and color papers). Agfachrome duplicating film, used as an original camera film, produces slides with high resolution and remarkable shadow detail. Ektachrome and Kodachrome films produce (as we like to call it) the "Walt Disney" effect of high color saturation with a color balance away from green and toward blue. Anscochrome films give a warmer rendition, but equally saturated in color as the Kodak products.

Black and White slides are not just "different" from color slides even though variety in a slide presentation isn't a bad idea in itself. Black and White slides have a completely different impact on the viewer. Some subjects demand this sort of impact. There are some that cannot be pictured with the photographer's intent in visual communication by using color film. The more obvious of these, are dramatic events such as battle scenes, riots, slum conditions, character studies of faces, technical operation of equipment. In these examples, the "prettiness" of color would serve to distract the viewer from the nature of the picture.

Less obvious uses of Black and White slides are those of figure studies and glamour pictures where impact can be of quite a different nature than that produced with color.

If you haven't tried it before - try it now - and don't hesitate to use both color and Black and White slides in the same presentation. We have found that the usual travel slide show can be enriched by such a simple device.

The universal formulas for reversal processing that follows are a modification of an early procedure used with Gevaert Black and White thin-emulsion still and motion picture films. It has been used by the authors for almost ten years with very satisfactory results on a variety of films.

Originally, the modified formulas were designed for Adox KB-14, Kodak Plus-X and Panatomic-X and for certain 8mm/16mm motion

picture films. However, we have found that they also work very well with Adox KB-17, Kodak Tri-X, and certain high-speed Dupont motion picture films. All films that we have used were exposed at rated ASA. No attempt has been made to alter the rated speeds of these films. Attempting to "push" film not originally intended for reversal processing is usually a poor idea in that, contrary to normal negative processing, there is little latitude in exposure for such processing.

The development of the first image (in the first developer) will have a great influence on the final result. Such first development must be complete and any blocking-up or ultra-thin details will suffer in the second development.

These comments are not intended to curtail individual experimentation with different films and procedures, however, an awareness of these limitations should be possessed by the experimenter.

It should be pointed out that there are no figures given as to life expectancy of the various baths below. It might be of interest to relate that we have processed film with baths that had been prepared, used, and replenished, over two years earlier with excellent results. (We don't recommend this as a standard procedure. The circumstances did not allow preparing new solutions, so we had to gamble on the old ones. We were prepared to accept less than average results, but we were lucky.)

Some comments about replenishment: When a bath has been used to such an extent that the amount of replenisher added equals the original volume of the working solution, no further replenishment should be made and the bath sould be discarded once its capacity has been exhausted.

This procedure is an advisable one since there will be an accumulation of processing by-products that could prove detrimental to the processed films. A replenisher is designed to maintain a chemical balance of a bath by regulating the pH and providing those portions of the original bath that have been chemically exhausted, physically removed on the processed film, or altered in activity by processing by-products introduced by carry-over in the film from preceeding baths. (There are other functions of replenishers that are dependent on the nature of the bath being replenished - but a more detailed explanation is not of practical importance to the content of this article.)

GENERAL NOTES:

Dissolve the chemicals in the order listed, making certain that each is completely dissolved before adding the next.

The same amount of Potassium Thiocyanate (P-690) can replace the Sodium Thiocyanate in the first developer.

If Photo-Flo (1:200) is used instead or the "600" form, use 3.0 cc instead of 1.0 cc.

Sodium Bisulfite can be replaced by the same amount of Potassium Metabisulfite (P-650)

The bleach replenisher is a concentrated form of the working solution. It might be simpler to prepare only bleach replenisher and from this a working solution can be made by taking 200.0 cc of bleach replenisher and adding 800.0 cc of water

DEVELOPERS

	First	Second	Dignan Catalog #
Water (90°F)	750.0 cc	750.0 cc	
Calgon (Photo Grade)	2.0 grams	2.0 grams	C-150
Metol (Elon)	4.0 grams	2.0 grams	DD-4
Hydroquinone	8.0 grams	4.0 grams	DD-14
Sodium Sulfite	50.0 grams	60.0 grams	S-790
Sodium Carbonate (Mono)	70.0 grams	47.0 grams	S-500
Sodium Thiocyanate	3.5 grams	-none-	S-800
Photo-Flo "600"	1.0 cc	1.0 cc	P-440
Potassium Bromide	3.5 grams	1.0 gram	P-530
Water to make	1.0 liter	1.0 liter	

DEVELOPER REPLENISHERS

	First	Second	Dignan Catalog #
Water (90°F)	750.0 cc	750.0 cc	
Calgon (Photo Grade)	1.0 gram	1.0 gram	C-150
Metol (Elon)	5.5 grams	3.0 grams	DD-4
Hydroquinone	13.5 grams	8.0 grams	DD-14
Sodium Sulfite	55.0 grams	65.0 grams	S-790
Sodium Carbonate (Mono)	76.0 grams	59.0 grams	S-500
Sodium Thiocyanate	4.0 grams	-none-	S-800
Sodium Hydroxide	2.5 grams	0.8 gram	*
Photo-Flo "600"	-none-	1.0 cc	P-440
Water to make	1.0 liter	1.0 liter	

	Bleach Bath	Replenisher	Dignan Catalog #
Water (90°F)	800.0 cc	800.0 cc	
Potassium Bichromate	5.0 grams	25.0 grams	*
Sodium Bisulfate	20.0 grams	100.0 grams	S-390
Water to make	1.0 liter	1.0 liter	

*Not carried by Dignan Photographic, Inc.

REVERSAL FORMULAS FOR B & W FILMS

	Clearing Bath	Replenisher	Dignan Catalog #
Water (95°F)	800.0 cc	800.0 cc	
Calgon (Photo Grade)	2.0 grams	2.0 grams	C-150
Sodium Sulfite	100.0 grams	120.0 grams	S-790
Sodium Bisulfite	5.0 grams	-none-	S-400
Water to make	1.0 liter	1.0 liter	

REPLENISHMENT SCHEDULE

(Each roll)

	120, 620, 127, 35mm 36 exp.	(Each roll) 35mm 20 exp.	(30 feet) Dbl.8mm/16mm
First Developer	37.0 cc	20.0 cc	92.0 cc
Bleach Bath	26.0 cc	14.0 cc	64.0 cc
Clearing Bath	18.0 cc	10.0 cc	45.0 cc
Second Developer	48.0 cc	25.0 cc	120.0 cc

Replenishment Procedure

Place replenisher amount into empty liter bottle used to store working solution, then pour back used working solution until bottle is filled. Discard any excess working solution.

PROCESSING CHART

Time in Minutes	Temperature in F°	Operation
6*	75	First Developer
1	68 - 80	Rinse
4**	75	Bleach Bath
4	68 - 80	Wash
4**	75	Clearing Bath
2	68 - 80	Wash
2		Second Exposure - 500 Watt lamp at two feet. Film see-sawed in water in white dish. One minute on each side of film.
6*	75	Second Developer
2	68 - 80	Wash
4	75	Acid hardening fixer (any fresh fixer for B & W film - not RAPID FIXER)

PROCESSING CHART (continued)

Time in Minutes	Temperature F °	Operation
4	68 - 80	Wash
1	68 - 80	Wetting solution (any fresh wetting solution for B & W film)

NOTES:

*Time and temperature for BOTH developers can be varied by use of the table below. For best results, it is usually a good practice to maintain the same temperature for all baths and washes.

**Bleaching goes to completion. As a general rule, (for this process) allow two-thirds of the time used in the first developer. See the table below. Clearing bath takes the same time as the bleach.

AGITATION

Continuous for the first 15 seconds in each bath, then 2 or 3 spiral turns (or 1 inversion) every 30 seconds.

TIME-TEMPERATURE TABLE

Temperature in F°	Time in Minutes	
	1st & 2nd Developers	Bleach Bath & Clearing Bath
68	8.0	5.5
70	7.5	5.0
72	7.0	4.5
75	6.0	4.0
77	5.5	4.0
80	5.0	3.5

DIGNAN NOTES ON ECO FORMULAS

Kodak's ECO-1 and -2 are official formulas for the processing of Commercial Ektachrome, however, they will work with most of the other Ektachrome emulsions. One of the main differences between the two sets is the color developer (note that the ECO-2 color developer contains citrizinic acid which must be used with the newer Ektachrome emulsions). The ECO-2 color developer also contains tertiary butylamine borane which is a fogging agent which replaces the re-exposure step of ECO-1. This color developer will work without the fogging agent provided the standard re-exposure to light is given before using this solution.

The persulfate-ferrocyanide bleach is cheaper to compound than a ferricyanide-bromide bleach (such as Kodak's SR-9, page C-83), but interchange should cause no problem with bleaching. The articles on ME-4 and E-4 should be studied in conjunction with these ECO formulas (see pages C-158, H-169 to H-171, H-178 to H-180).

If you are going to compound one shot type formulas, you can resort to some of the simpler secondary formulas listed in ECO-1. For instance, the stop hardener in ECO-1 is a plain potassium chrome alum solution. The acid rinse, first and second stop bath, can be compounded with the acetic acid only. Sodium hydroxide can be eliminated. The fixing bath can be compounded with sodium thiosulfate only, omitting the sodium sulfite.

We would suggest compounding a set of one shot formulas using the first developer from ECO-2 and also the color developer minus the fogging agent or you can use the official Kodak color developer SD-35 (page I-194). If the above substitutions are made, the time temperature chart for ECO-1 should be used, not ECO-2. If you have problems with reticulation using the 80° first developer time, you may have to resort to an E-2 time table such as appears on page B-54.

The introduction of ECO-2 and E-4 are the result of manufacturing changes in the Kodak emulsions. They are softer than previous emulsions. Remember, that many of the above suggestions are valid ONLY if you are compounding solutions that you will use once and then discard. We always advocate the "one shot type" of processing if you do not plan to do a large amount of film. There are a number of good reasons for this.

1. Replenishment at best contains too many variables that are difficult to control.
2. Fresh solutions will give you a consistency that NO lab can duplicate with machine processing.
3. Fresh solutions remove the possibilities that one or more of the baths are not functioning because of oxidation or weakened chemical action caused by use, storage, inadequate replenishment, etc.
4. A fresh solution is chemically more efficient and does its work rapidly.

FOR MACHINE PROCESSING

EKTACHROME COMMERCIAL FILM TYPE 7255

Step	Solution	Time	Temperature
1.	FIRST DEVELOPER	6 min	80°F
2.	WASH	1 min 30 sec	75°F
3.	FIRST HARDENER	1 min 30 sec	75°F
4.	ACID RINSE	45 sec	75°F
5.	WASH	45 sec	75°F
5A.	White light exposure either from the emulsion or the base side approximately 14,300 ft candles.		
6.	COLOR DEVELOPER	5 min	80°F
7.	WASH	45 sec	75°F
8.	SECOND HARDENER	1 min 30 sec	75°F
9.	ACID RINSE	45 sec	75°F
10.	WASH	45 sec	75°F
11.	FERRICYANIDE BLEACH	1 min 30 sec	75°F
12.	FIX	1 min 30 sec	75°F
13.	WASH	2 min 15 sec	75°F
14.	STABILIZER	45 sec	75°F
15.	DRY		

FIRST DEVELOPER

Water	800.0	cc	
Sodium Tetraphosphate**	.6	gram	*
Sodium Bisulfite	2.5	grams	S-400
Elon	4.65	grams	DD-4
Sodium Sulfite	47.0	grams	S-790
Hydroquinone	3.0	grams	DD-14
Sodium Sulfate	59.0	grams	S-770
Sodium Carbonate (Anly.)	30.0	grams	S-501
Sodium Thiocyanide	2.6	grams	*
Sodium Bromide	2.0	grams	S-425
Potassium Iodide (0.1% sol.)	4.0	cc	P-600
Water to	1.0	liter	

HARDENER - FIRST & SECOND

Water	800.0	cc	
Potassium Chrome Alum	30.0	grams	P-550
Water to	1.0	liter	

ACID RINSE - FIRST & SECOND

Water	800.0	cc	
Glacial Acetic Acid	30.0	cc	*
Sodium Hydroxide	1.75	grams	*
Water to	1.0	liter	

*Not carried by Dignan Photographic, Inc.
**This is similar to Calgon - can be used as a substitute.

OFFICIAL PROCESSING FORMULAS
FOR ECO-1

COLOR DEVELOPER

Water	800.0	cc	
Sodium Tetraphosphate**	5.0	grams	*
Benzyl Alcohol	4.51	cc	B-200
Sodium Sulfite	5.20	grams	S-790
Sodium Bromide	.6	gram	S-425
Ethylenediamine	2.50	grams	*
Potassium Iodide (0.1% sol.)	10.0	cc	P-600
Sodium Hydroxide	1.8	grams	*
Trisodium Phosphate	40.0	grams	*
CD-3	11.3	grams	DD-3
Citrazinic Acid	1.9	grams	C-240
Water to	1.0	liter	

FERRICYANIDE BLEACH

Water	800.00	cc	
Sodium Bromide	38.0	grams	S-425
Sodium Ferrocyanide	182.0	grams	S-566
Potassium Persulfate	48.0	grams	*
Carbowax #1540 (50% sol.)***	10.0	cc	*
Water to	1.0	liter	

FIXING BATH

Water	800.0	cc	
Sodium Thiosulfate	128.0	grams	S-810
Sodium Sulfite (des.)	9.0	grams	S-790
Water to	1.0	liter	

STABILIZING BATH

Water	800.0	cc	
Formalin (Formaldehyde 37.5% sol.)	4.0	cc	*
Water to	1.0	liter	

*Not carried by Dignan Photographic, Inc.
**This is similar to Calgon - can be used as a substitute
***Used as an accelerator

OFFICIAL PROCESSING FORMULAS
FOR ECO-2

FOR MACHINE PROCESSING

EKTACHROME COMMERCIAL FILM TYPE 7255

Step	Solution	Time	Temperature
1.	PREHARDENER	2 min 30 sec	95°F
2.	NEUTRALIZER	30 sec	100°F
3.	FIRST DEVELOPER	3 min	100°F
4.	FIRST STOP BATH	30 sec	100°F
5.	WASH	30 sec	100°F
6.	COLOR DEVELOPER		110°F
7.	SECOND STOP BATH	30 sec	100°F
8.	FERRICYANIDE BLEACH	1 min 30 sec	100°F
9.	FIX	1 min 30 sec	100°F
10.	WASH	1 min	100°F
11.	STABILIZER	30 sec	100°F
12.	DRY		

PREHARDENER

Water	800.0	cc	
p-toluenesulfinic acid (sodium salt)	.5	gram	*
Sulfuric Acid 18N	5.41	cc	*
Dimethoxytetrahydrofuran(See Note 1)	4.30	cc	*
Sodium Sulfate	154.0	grams	S-770
Sodium Bromide	2.0	grams	S-425
Sodium Acetate	20.0	grams	S-370
Formalin (37% Formaldehyde sol.)	27.0	cc	*
Water to	1.0	liter	

NEUTRALIZER

Water	800.0	cc	
Hydroxylamine Sulfate	22.0	grams	H-650
Sodium Bromide	17.0	grams	S-425
Glacial Acetic Acid	10.0	cc	*
Sodium Hydroxide	6.0	grams	*
Sodium Sulfate	50.0	grams	S-770
Water to	1.0	liter	

FIRST DEVELOPER

Water	800.0	cc	
Sodium Tetraphosphate**	2.0	grams	*
Sodium Bisulfite	3.8	grams	S-400
Phenidone	.19	gram	DD-5
Sodium Sulfite	35.0	grams	S-790

*Not carried by Dignan Photographic, Inc.
**This is similar to Calgon - can be used as a substitute

Note #1: The chemical reaction of the prehardener and neutralizer were explained in the revue of ME-4. See pages C-158, H-169 to H-171, H-178 to H-180.

FIRST DEVELOPER (continued)

Hydroquinone	4.0	grams	DD-14
Sodium Sulfate	54.0	grams	S-770
Sodium Carbonate (Anhy.)	30.0	grams	S-501
Sodium Thiocyanate	2.6	grams	S-800
Sodium Bromide	2.0	grams	S-425
Potassium Iodide (0.1% sol.)	6.0	cc	P-600
Water to	1.0	liter	

FIRST AND SECOND STOP BATH

Water	800.0	cc	
Glacial Acetic Acid	30.0	cc	*
Sodium Hydroxide	1.75	grams	*
Water to	1.0	liter	

COLOR DEVELOPER

Water	800.0	cc	
Sodium Tetraphosphate**	5.0	grams	*
Benzyl Alcohol	5.6	cc	B-200
Sodium Sulfite	5.5	grams	S-790
Trisodium Phosphate	37.0	grams	*
Sodium Bromide	.9	gram	S-425
Potassium Iodide (01.% sol.)	31.0	cc	P-600
Sodium Hydroxide	3.25	grams	*
Citrazinic Acid	3.6	grams	C-240
CD-3	5.5	grams	DD-3
Ethylenediamine 98%	1.76	grams	*
Tertiary Butylamine Borane***	.07	gram	*
Water to	1.0	liter	

FERRICYANIDE BLEACH

Water	800.0	cc	
Sodium Bromide	35.0	grams	S-425
Sodium Ferrocyanide	240.0	grams	S-566
Potassium Persulfate	67.0	grams	*
Borax ($10H_20$)	1.0	gram	B-301
Sodium Hydroxide	.1	gram	*
Water to	1.0	liter	

FIXING BATH

Water	800.0	cc	
Sodium Thiosulfate (Anly.)	128.0	grams	S-810
Sodium Sulfite	9.0	grams	S-790
Water to	1.0	liter	

STABILIZING BATH

Water	800.0	cc	
Formalin (37.5% Formaldehyde sol.)	12.0	cc	*
Water to	1.0	liter	

*Not carried by Dignan Photographic, Inc.
**This is similar to Calgon - can be used as a substitute
***Fogging Agent